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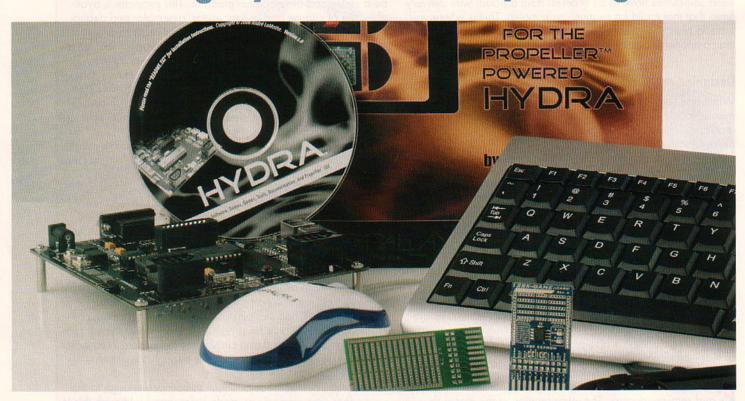### What is "**Embedded - Microcontrollers**"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "**Embedded - Microcontrollers**"

Details	
Product Status	Active
Core Processor	PIC
Core Size	8-Bit
Speed	32MHz
Connectivity	LINbus, UART/USART
Peripherals	Brown-out Detect/Reset, POR, PWM, WDT
Number of I/O	18
Program Memory Size	14KB (8K x 14)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	1K x 8
Voltage - Supply (Vcc/Vdd)	2.3V ~ 5.5V
Data Converters	A/D 12x10b; D/A 1x5b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 125°C (TA)
Mounting Type	Surface Mount
Package / Case	20-SSOP (0.209", 5.30mm Width)
Supplier Device Package	20-SSOP
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic16f1579-e-ss

Hydra Game Development Kit

Design your own computer games for the Propeller chip

Luc Lemmens

This month we discuss an entirely different type of development kit compared to what we are 'normally' accustomed to. Most kits consist of a processor board with a bit of I/O, LEDs, displays, etc., that a designer can use to gain experience with a certain type of processor by working through a few (simple) examples. With the Hydra kit the objective is completely different, namely learning the development of computer games.

The design and composition of the Hydra kit is therefore very different from the average development system. The multi-tasking capabilities of the Propeller chip from Parallax are eminently suitable for a computer game.

Computer games comprise many tasks that have to be carried out simultaneously, such as the reproduction of video and audio, calculations, search algorithms, etc. The Propeller contains eight 32-bit processor cores which can work simultaneously and is therefore made for this type of application.

For those among us who have worked with 'classical' microcontrollers up to now, the Propeller will require a different way of thinking because the internal structure is very different from what we are used to.

Documentation

The thing that immediately stands out when you open the box containing the Hydra kit is the 800-page manual: a real book! This is quite unusual these days, but Parallax obviously considers it important to provide a printed manual with their products. With development kits from other vendors you often are faced with a laborious search for manuals on the included CDs and it is not always clear where you have to start. Not everyone (understatement?) is likely to print documents of this size and read them thoroughly first. However, this is exactly what this book recommends: read first and then get stuck into it. But don't let that discourage you, the manual progresses at a rapid pace and contains, in addition to the theory, also nice 'excursions' such as a chapter about the highlights of the history of hard- and software for game computers

The entire book is also on the CD that comes with the kit. On this disc we also find the development software, numerous programming examples and many extras among which the e-book 'The Black Art of 3D Game Programming' stands out. About ten years ago this book was the 'bible' for games programmers and still contains much useful material and background information.

The manual leads us past the architecture of the Propeller chip, the programming language Spin (specifically developed for this processor) and the assembly language for this processor to our ultimate goal: the development of computer games. This part occupies about half of the book and deals, after a short introduction, with subjects such as graphics, processing of input, sound, animation, artificial intelligence, physics modelling, in summary: everything that is relevant when programming computer games.

The Hydra processor board

The Propeller is the heart of the Hydra-system, but a processor by itself does not make a game computer of course. That is why it is expanded with a number of interfaces and options (see sidebar), most of which will be familiar so there is no need to explain those further. They are all described in detail in the book, but we will explain a little more about the less familiar ones.

The debug indicator is nothing more than an LED that can be used during debugging, for example as a sign that a certain program loop has completed. A little primitive and old-fashioned method of debugging, but unfortunately the current development environment for the Propeller does not (yet) support any other method of debugging. This is nonetheless sufficient in many cases to enable progress to be made when there are problems in the software. The LED is driven via a port pin on the processor and the user can turn this on or off at any desired location in the application. The expansion port for the game cartridge and EEPROM is a standard 20-way, 0.1-inch card edge connector that contains most of the signals for connecting external hardware. On this connector you'll find power supply voltages, eight I/O lines, Hydra Net (see later on), reset, I2C and serial connections. In addition, feedback from the power supply voltages signals the presence of external hardware to the processor. The Hydra kit contains a blank cartridge board so you can build your own hardware and a small PCB with a 128-kB EEPROM plus a small prototyping area.

The Hydra Net connection is intended to let two Hydras communicate with each other via a simple and cheap serial connection. A standard 4-core telephone cable with RJ-11 connectors was selected to enable a cheap but still reliable connection to be made.

Peripherals

The game development kit contains, in addition to all the cables, also a mouse, keyboard and game pad and a (North American!) mains adapter. Importers such as Milbrook Instruments (for the UK) may supply a converter for connection to the local mains. Reasonably complete, so that you can get started immediately, but – as already mentioned – the book recommends that you read it first before connecting anything. Good advice that is disregarded all too frequently. Some experience with a higher programming language and assembler is certainly recommended.

Development software

The development environment that comes with the kit has been specifically designed by Parallax for the Propeller chip and works under Windows 2000, XP and Vista. This software is very simple to install and use. The Spin programming language looks like a mix of Pascal, Basic and assembly language and is reasonably straightforward to become familiar with.

An application for the Propeller can consist of modules that are written in Spin and modules that are written in assembler. The assembly language will require a bit of practice, but runs many times faster than Spin, which is certainly very important for time-critical processes (such as video-output, for example). In order to make lightning-fast games you will not be able to ignore assembly programming and you will have to get past the sour taste; on the other hand, some will feast on it! Nevertheless, assembler is not covered all that well in the book, it receives very little attention. But other documentation on the CD and on the Parallax website provides more clarification for those who are interested. Note that the development software is a free download, so you can use that too if you would like to find out a little more about the Propeller first.

Conclusion

The Hydra Game Development Kit is a very complete package for the development of software and – naturally – computer games in particular. The hardware is, with respect to memory size, somewhat limited and therefore do not expect to be able to develop a 'state-of-the-art' PC game or a console game. But it is eminently suitable to learn the underlying techniques that play a role in this type of application.

From the peripherals the only thing that's really missing is the monitor, but any standard VGA monitor or a TV with composite video input will work well here. Everything considered, this kit is certainly worth the purchase price of £ 165 (€ 180; US$ 199.95)!

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